

ICHTHYOLOGY.—*A new species of goby and new records of fishes from the Solomon Islands.*<sup>1</sup> ROBERT R. HARRY, Natural History Museum, Stanford University. (Communicated by Herbert Friedmann.)

During a period from the early summer of 1944 to the late spring of 1945 Robert C. Pendleton, of Weber College, Ogden, Utah, accumulated a small collection of fishes from the Solomon Islands. At least 40 species were taken southeast of "The Slot" (New Georgia Sound) below Indispensable Strait from the Aggella Group (sometimes Ngella) at Russell (Pavuvu), Gavutu, Tulagi, Florida, and Guadalcanal (Guadalcanar) Islands. Many of the species are new records for the Solomon Islands, and almost all are at least new distributional records within the Solomons. Apparently the few specimens collected from Renard Sound, Banika Island, represent the first fish collection ever recorded from the Russell Group.

Pendleton's collections were taken at seven definite localities: (1) Renard Sound, Banika Island, Russell Group, latitude 9°5'S., longitude 159°13'E. (U. S. Hydrographic Office Chart 5980). (2) Brackish creek near Lengo, approximately 2 miles east of the mouth of the Tenaru River, on the north coast of Guadalcanal Island, latitude 9°25'S., longitude 160°8'30"E. (H. O. Chart 2896). (3) Sea level on mud flats at mouth of Tenaru River near the village of Tenaru, Guadalcanal Island, latitude 9°30'S., longitude 160°6'E. (H. O. Chart 2896). (4) Little Tenaru River, southeast tributary of the Tenaru River, latitude 9°30'S., longitude 160°6'E. (H. O. Chart 2896). (5) Tulagi Harbor between Tulagi Island and Makambo Island, Florida Group, latitude 9°5'S., longitude 160°9'E. (H. O. Chart 2916). (6) Gavutu Bay between Gavutu Island and Hutchison Point, Florida Islands, latitude 9°6'S., longitude 160°11'E. (H. O. Chart 2916). (7) Purvis Bay, mouth of Hutchison Channel, north of Port Purvis, Florida Island, latitude 9°6'20"S., longitude 160°13'30"E. (H. O. Chart 3012).

A new species of goby, or sleeper, is described from material taken in a small creek on Guadalcanal and represents the second known species of *Fagasa*, a genus previously

known only from a single specimen from Tutuila Island, Samoa Islands. In addition to the material reported upon, an apparently very distinct undescribed species of *Doryichthys* collected entering a creek near the ocean 1 mile west of Tenaru River, Guadalcanal Island, May 20, 1944, is not included here. This single specimen obtained has been forwarded to Dr. Earl S. Herald, of the California Academy of Sciences, to be included in his investigations of the family Syngnathidae.

The literature on the fishes of the Solomon Islands is extremely scattered and incomplete. Until very recently<sup>2</sup> no actually intensive collections had been undertaken there; although various British, Australian, and American collectors have obtained many specimens during short stays in the Archipelago. The fish fauna of the Solomons was almost completely unknown previous to Dr. Albert Günther's important contribution (1873) in the fish section of Brenchley's *Cruise of the Curaçoa among the South Sea Islands*. Günther compiled a list of 68 species of fishes, including two new species, from three separate Solomons collections received nearly at the same time by the British Museum. No data as to locality within the Solomon Islands were given. Alvin Seale (1906) made extensive collections in the South Pacific for the Bishop Museum about 1903 and obtained a large collection of fishes from Shortland Island in the northern part of the Solomons. Six species were described as new. The most important recent review is the very useful checklist of the fishes of the Solomon Islands by Herre (1931). Many of the specimens upon which Herre based his checklist are at Stanford University and have been compared with the present material.

<sup>2</sup> Dr. Wilbert McLeod Chapman, while with the Foreign Economic Administration of the United States Government, amassed excellent large collections of the shore and pelagic fishes of the Solomon Islands. At present this material is partly at the School of Fisheries, University of Washington, and partly at the United States National Museum.

<sup>1</sup> Received December 3, 1948.

Subsequent to Herre, the Templeton Crocker Expedition to western Polynesian and Melanesian Islands, 1933, returned with excellent collections from throughout the Solomons. Seale (1935) reported upon this material, which is presently in the fish collection of the California Academy of Sciences.

The Pendleton collection, including the types, has been deposited in the Natural History Museum of Stanford University, and the number before each locality represents the Stanford catalog number. A set of duplicate specimens has been retained by the collector.

I wish to thank Mr. Pendleton for allowing me to prepare this report upon his interesting collections of fishes and for considerable help throughout. He prepared extensive ecological notes of several of the species and intends to have these observations published.

#### SYNODIDAE

##### (1) *Saurida undosquamis* (Richardson)

No. 14761, Purvis Bay, Florida Island, January 22, 1945, 1 specimen.

The range of this species is from East Africa through the Indian Ocean to Australia and Japan. Exact records of its distribution are somewhat confused, because this form has been confounded with the so-called *Saurida tumbil* (Bloch). Apparently it has not been recorded in the Solomons. The nearest previous record is in the Louisiade Archipelago.

#### ANGUILLIDAE

##### (2) *Anguilla bicolor* McClelland

No. 14758, Brackish creek near Lengo, Guadalcanal Island, May 20, 1944, 1 specimen.

This species is known throughout the East Indian Archipelago. Its range is here extended eastward from New Britain and numerous localities in northern New Guinea.

#### MURAENIDAE

##### (3) *Muraena undulata* (Lacepède)

No. 14760, Purvis Bay, Florida Island, December 23, 1944, 1 specimen.

This species is distributed from the east coast of Africa through the Indian Ocean eastward to Australia and as far as the Hawaiian Islands. Seale (1935, p. 343) records it from the Solomons at Sikaiana Island, Stewart Islands.

##### (4) *Echidna nebulosa* (Ahl)

No. 14759, Purvis Bay, Florida Island, December 23, 1944, 1 specimen.

East coast of Africa to Australia, Pacific islands. Recorded from Tulagi Island, Florida Islands by Seale (1935, p. 343).

#### SYNGNATHIDAE

##### (5) *Hippocampus kuda* Bleeker

No. 14762, Purvis Bay, Florida Island, January 23, 1945, 1 specimen.

Distribution from East Africa through the Indo-Australian Archipelago and to Japan. The species has not been recorded before from the Solomon Islands but has been taken from nearby British South New Guinea.

#### SERRANIDAE

##### (6) *Epinephelus cyanostigma* (Cuvier and Valenciennes)

No. 14767, Purvis Bay, Florida Island, December 22, 1944, 1 specimen; No. 14768, same locality, April 1, 1945, 1 specimen; No. 14769, same locality, January 21, 1945, and March 29, 1945, 1 specimen.

Range: Indo-Australian Archipelago. Not previously recorded from Solomon Islands.

##### (7) *Epinephelus urodelus* (Cuvier and Valenciennes)

No. 14772, Purvis Bay, Florida Island, no date, 1 specimen.

Known from Madagascar through Indian Ocean, Indo-Australian Archipelago eastward to Society Islands. Not previously recorded from the Solomon Islands.

##### (8) *Epinephelus pachycentron* (Cuvier and Valenciennes)

No. 14771, Purvis Bay, Florida Island, December 16, 1944, 1 specimen.

Previously recorded in the Solomons from Tulagi Island, Florida Group by Seale (1935, p. 359).

##### (9) *Epinephelus diacanthus* (Cuvier and Valenciennes)

No. 14770, Purvis Bay, Florida Island, December 20, 1944, 1 specimen.

Distributed from East Africa through Indian Ocean to eastern Pacific. Apparently this record represents a range extension eastward from the Philippines.

## PSEUDOCROMIDAE

(10) *Pseudochromis fuscus* Müller and Troschel

No. 14799, Purvis Bay, Florida Island, December 23, 1944, 4 specimens; No. 14800, same locality, January 21 and March 29, 1945, 2 specimens.

Recorded by Herre (1931, p. 6) from Shortland Island, Solomons.

## CARANGIDAE

(11) *Caranx crumenophthalmus* Bloch

No. 14765, Purvis Bay, Florida Island, January 20, 1945, 1 specimen.

Apparently this is the first definite locality record within the Solomon Archipelago.

(12) *Caranx chrysophrys* Cuvier and Valenciennes

No. 14764, Purvis Bay, Florida Island, February 5, 1945, 1 specimen.

Distribution from east Africa through Indian Ocean to Australia. Apparently closest record to Solomons is Queensland.

(13) *Decapterus macrosoma* Bleeker

No. 14766, Renard Sound, Banika Island, Russell Group, March 15, 1945, 1 specimen.

Range: East Africa to Australia. Not previously mentioned from Solomon Archipelago.

## LUTIANIDAE

(14) *Lutianus vitta* (Quoy and Gaimard)

No. 14775, Purvis Bay, Florida Island, March 25, 1945, 1 specimen.

Range: Seychelles Islands through Indian Ocean to Australia. Previously not known from Solomons. Closest records New Guinea and Louisiade Archipelago.

(15) *Lutianus sebae* (Cuvier and Valenciennes)

No. 14774, Purvis Bay, Florida Island, March 29, 1945, 1 specimen.

East coast of Africa through Indian Ocean, Indo-Australian Archipelago to Australia. Not recorded from Solomons.

(16) *Pentapodus setosus* Cuvier and Valenciennes

No. 14776, Purvis Bay, Florida Island, March 22, 1945, 1 specimen.

Range: Indo-Australian Archipelago. Previously unrecorded in Solomons.

(17) *Monotaxis grandoculis* (Forskål)

No. 14777, Purvis Bay, Florida Island, May 18, 1945, 1 specimen.

Herre (1931, p. 7) established this species in the Solomons from Tenibuli, Ysabel Island; Hathorn Sound, New Georgia Island; Shortland Island; Sikaiana Island; Stewart Island.

## MULLIDAE

(18) *Upeneus vittatus* (Forskål)

No. 14763, Purvis Bay, Florida Island, May 18, 1945, 1 specimen.

Very common in Indo-Australian Archipelago. Apparently never reported from the Solomon Islands.

## KYPHOSIDAE

(19) *Kyphosus cinerascens* (Forskål)

No. 14778, Gavutu Island, Florida Group, May 18, 1945, 1 specimen.

Mentioned by Herre (1931, p. 7) from Solomons at Tenibuli, Ysabel Island; and Shortland Island.

## CHAETODONTIDAE

(20) *Chaetodon octofasciatus* Bloch

No. 14787, Purvis Bay, Florida Island, January 21, 1945 and March 29, 1945, 1 specimen.

Ranges through Indo-Australian Archipelago. Recorded by Herre (1931, p. 7) from Solomons at Tenibuli, Ysabel Island, and Bougainville Island. Weber and de Beaufort (1936, p. 75) establish it from New Pommern, Solomons.

## POMACENTRIDAE

(21) *Pomacentrus tripunctatus* Cuvier and Valenciennes

No. 14782, Purvis Bay, Florida Island, December 23, 1944, 1 specimen; No. 14783, Purvis Bay, Florida Island, January 21, 1945, and March 29, 1945, 2 specimens.

Recorded from the Solomons by Herre (1931, p. 8) from Auki, Malaita Island; Hathorn Sound, New Georgia Island; Tenibuli, Ysabel Island.

(22) *Pomacentrus bifasciatus* Bleeker

No. 14781, Purvis Bay, Florida Island, December 23, 1944, 3 specimens.

Range: Indian Ocean and Archipelago. Previously unrecorded from Solomons. Closest published accounts at Palau (Pelew) Islands,

Boston Island (Ebon Atoll) and Duke of York Island.

(23) *Dascyllus aruanus* Linnaeus

No. 14779, Purvis Bay, Florida Island, January 21, 1945, and March 29, 1945, 4 specimens.

Previously recorded by Herre (1931, p. 8) from the Solomons at Shortland Island; Kungava Bay, Rennell Island; Sikaiana Island, Stewart Islands.

(24) *Dascyllus melanurus* Bleeker

No. 14780, Purvis Bay, Florida Island, January 21, 1945, and March 29, 1945, 1 specimen.

Previously recorded from the Solomons by Herre (1931, p. 8) at Shortland Island and by Seale (1935, p. 368) at Kungava Bay, Rennell Island; Sikaiana Island, Stewart Islands.

(25) *Premnas biaculeatus* (Bloch)

No. 14784, Purvis Bay, Florida Island, January 21, 1945, and March 29, 1945, 1 specimen.

Previously recorded from Kungava Bay, Rennell Island, Solomons by Seale (1935, p. 365).

LABRIDAE

(26) *Cheilinus fasciatus* (Bloch)

No. 14785, Purvis Bay, Florida Island, December 28, 1944, 1 specimen.

Previously reported from the Solomons by Herre (1931, p. 8) at Tenibuli, Ysabel Island; Shortland Island.

(27) *Thalassoma lunare* (Linnaeus)

No. 14786, Purvis Bay, Florida Island, January 16, 1945, 1 specimen.

Previously recorded from the Solomons by Herre (1931, p. 8) at Hathorn Sound, New Georgia Island, and Shortland Island.

TEUTHIDIDAE

(28) *Zebrasoma flavescens* (Bennett)

No. 14788, Renard Sound, Banika Island, Russell Group, April 14, 1945, 1 specimen.

Previously recorded from Hathorn Sound, New Georgia Island, Solomons, by Herre (1931, p. 7).

ELEOTRIDAE

(29) *Eleotris melanosoma* Bleeker

No. 14795, Little Tenaru River, Guadalcanal Island, May 14, 1944 (fresh water), 1 specimen.

Reported by Herre (1931, p. 9) from Auki, Malaita Island, Solomons, in fresh water.

(30) *Fagasa diaphana*, n. sp.

This species is very closely related to *Fagasa tutuilae* Schultz (1943, p. 253) and represents the second known species of this remarkable genus. Schultz described *F. tutuilae* from a single young specimen 18.5 mm in standard length. Though he distinguished this genus from all other groups of the family Eleotridae, he made no mention of its relationships and position in the family. One of the most striking characteristics of *F. tutuilae* is its emarginate caudal (shown as lunate in the figure), which apparently is present in only one other eleotrid genus, *Ptereleotris*. All other eleotrids have rounded or elongated caudals. *Ptereleotris*, however, has much higher counts for soft dorsal rays (24–32 versus 6–8), anal soft rays (22–27 versus 8), and longitudinal scale series (150–170 versus 19–31). It is expected that future collections near the mouths of shallow coastal streams in the Pacific oceanic islands will reveal additional representatives of this group.

*Holotype*.—Stanford University No. 14894; 17.3 mm in standard length; mouth of small brackish stream near Lengo, north coast of Guadalcanal Island, May 20, 1944.

*Paratypes*.—Stanford University no. 14895; 6.8–18.3 mm in standard length; same data as holotype; 70 specimens. Stanford University number 14896; 15.8–18.4 mm in standard length; entering creek, one mile west of Tenaru River (from salt water), Guadalcanal Island, May 20, 1944; 3 specimens.

*Diagnosis*.—This species is referable to the genus *Fagasa* on the basis of the following characters: Mouth nearly vertical; no teeth on vomer; gill membranes continued moderately far forward and joined to the isthmus without a free fold across it; body anteriorly naked; the scales ctenoid, beginning under the second dorsal; dorsal fin rays VI, I, 8; anal fin I, 8; pectoral fin 17 or 18; pelvic fins completely separate without connecting basal membrane; all fin rays simple, unbranched; caudal fin emarginate or lunate.

This species can be readily differentiated from the only other known species, *F. tutuilae*. The lower jaw in *diaphana* is prominent, definitely entering into the dorsal profile, while in *tutuilae*

the lower jaw is not so well developed and does not enter the dorsal profile. Scales 19–21 in a midlateral series to caudal base in the latter, 31 in the former. The scales in the new species are confined to an oval patch on the sides of the body 6 or 7 scales in height; no scales extend onto the caudal fin. The figure of *tutuila* shows the scales apparently continuous on each side of the body dorsally behind the dorsal fin and ventrally behind the anal fin; there appear to be at least 10 oblique scale rows; in addition the base of the caudal fin is illustrated as scaled. None of these scale characters are discussed by Schultz, however. The pelvic fins in *diaphana* extend only slightly beyond a vertical from the origin of the first dorsal fin, but in the figure of *tutuila* the pelvics extend beyond the first dorsal fin base.

*Description.*—Measurements were made with fine-pointed dividers and divided into either head or standard length as indicated. Considering the very small size of the types, there is an unavoidably significant margin of error in measurement, and only the measurements for the holotype are presented. More importance has been placed in the description of species characteristics. Counts were taken from 25 specimens. The results for the paratypes are placed in parentheses and are preceded by those for the holotype.

Body elongate, moderately compressed, greatest depth between tips of pelvic fins and anus, 6.4 in standard length.

Head elongate, somewhat depressed, its length 3.6 in standard length. Profile almost straight between snout and interorbital; slightly raised before vertical from eye. Snout length 4.5 in head. Anterior nostril at border of labial fold, on a level with middle of eye. Posterior nostril at upper anterior border of eye. Both nostrils lack raised borders except anterior margin of posterior nostril with a slightly raised flap. Orbit large, posterior margin nearer to snout tip than opercular margin, diameter 5.0 in head length. Interorbital much narrower than eye diameter, 8.3 in head. Jaws strongly oblique, the lower jaw prominent, definitely entering into the dorsal profile. Maxillary extends distinctly lower than eye in horizontal level, but does not reach a vertical from anterior margin of eye. Length of upper jaw 3.3 in head. Jaws with a single row of moderate canines laterally, two or three closely spaced rows anteriorly. No teeth evident on vomer or palatines.

The pattern of head papillae distinctly the same as that characteristic of the subfamily Eleotrinae (see Harry, 1948, pp. 14–15, figs. 1, 2). No pores are present except one, usually denoted in the literature as pore a, that is situated at the upper posterior border of the eye. No papillary grooves are present. Generally five single papillae lines radiate from the ventral border of eye. Papillae lines on sides of head prominent, in single series. Interorbital naked, lacking papillae, except for three short parallel rows radiating inward from eye (genipore rows *t*, *v*, and *w*); *b* and *d* series on cheek well developed; *c* series very short, confined to above end of maxillary; *a* series irregular, interrupted and indistinct; *os*, *ot*, and *or* series on operculum well developed and elongate. A single continuous row of papillae designated by Ilgin and de Buen as *n* extends completely across the nape.

Scales ctenoid with large ctenii, confined to posterior half of body in an oval-shaped area on each side. Scales begin above origin to end of anal base and extend almost to base of caudal fin. Nineteen to 21 scales from where they begin along midaxis of body to base of caudal fin. Six or seven vertical oblique series of scales.

First dorsal fin rounded, with six rays. Outline not as in figure of *tutuila*. First rays graduated, third ray longest. Last spinous dorsal ray very short, bound to back. Length of first dorsal base 7.3 in standard length. Origin of first dorsal over tips of pelvic rays, its distance from tip of snout 2.3 in standard length. Second dorsal outline as in figure of *tutuila*, except penultimate and last rays shorter, the outline more abruptly rounded. Length of second dorsal base 7.9 in standard length. Origin of second dorsal slightly in advance of anal origin. Anal rays I, 8, outline of fin the same as in *tutuila*. Length of anal base 7.9 in standard length. Distance from tip of snout to anal origin 1.7 in standard length.

Pectoral large and rounded with 17 or 18 rays, extending to a vertical from the end of the base of the first dorsal. Length of longest pectoral ray 4.8 in head length. Pelvic fins I, 5, separated to the base and without a basal membrane. Pelvic origin slightly behind pectoral origin, its rays extending slightly beyond a vertical from first dorsal origin. Outline of pelvic fins similar to that of *tutuila*.

Caudal fin large; lunate or emarginate. No scales on base of fin. Principal caudal rays 12

or 13, none divided. Length of caudal fin 3.8 in standard length.

Measurements in percentage of standard length: Body depth 15.6; caudal peduncle least depth 12.3; length of caudal peduncle from base of last dorsal ray to midbase of caudal fin 26.5; head length 28.9; snout length 6.4; upper jaw length 8.7; orbit length 5.8; interorbital width 3.5; distance from tip of snout to spinous dorsal origin 41.6; spinous dorsal base length 13.9; longest dorsal spine length 15.3; soft dorsal base length 12.7; distance from tip of snout to anal origin 58.3; anal base length 12.7; longest anal soft ray length 14.4; pectoral fin base width 5.8; pectoral fin length 20.8; distance from tip of snout to pelvic fin origin 30.0; pelvic fin length 16.8; caudal fin length from midbase to tip of longest lateral ray 26.0.

*Coloration*.—Mr. Pendleton has informed me that all the specimens were "virtually transparent" when alive. In alcohol (first preserved in formaldehyde) they are an opaque flesh color with large scattered chromatophores arranged in a definite characteristic pattern. Body with a few scattered melanophores on upper sides of body, on the base of the pectoral fin and a single series along each side of the bases of the dorsal fins. A darker, more deeply imbedded interrupted pigment streak extends along the mid-ventral line of the body from a vertical immediately behind the eye to the procurrent caudal rays. A longitudinal blotch is present on the median section of chin. The most striking color feature is a rectangular blotch of melanophores at the base of the caudal fin. Widely spaced scattered melanophores present behind eye and on top of head, somewhat concentrated on occiput.

This species is named *diaphana* from the Greek *diaphanes* = transparent in reference to the transparency of the living examples.

#### Gobiidae

##### (31) *Gobiodon erythrospilus* Bleeker

No. 14899, Purvis Bay, Florida Island, December 23, 1944, 1 specimen.

It has not been recorded from the Solomons in the literature.

##### (32) *Gobiodon quinquestrigatus* Cuvier and Valenciennes

No. 14796, Purvis Bay, Florida Island, December 23, 1944, 14 specimens; no. 14797,

Purvis Bay, Florida Island, January 21, 1945, or March 29, 1945, 1 specimen.

A large number of forms, probably several distinct species are recognized under this species. The genus *Gobiodon* is in great need of revision.

Previously recorded under the name *Gobiodon rivulatus* from Kungava Bay, Rennell Island by Seale (1935, p. 372 and from Howla Island, Solomons, by Herre (1931, p. 9).

##### (33) *Paragobiodon echinocephalus* (Rüppell)

No. 14798, Purvis Bay, Florida Island, December 23, 1944, 21 specimens.

Previously recorded from Bougainville Island and Shortland Island, Solomons, by Herre (1935, p. 9).

#### PERIOPHTHALMIDAE

##### (34) *Periophthalmus koelroeteri* (Pallas)

No. 14897, mouth of small brackish stream near Lengo, north coast of Guadalcanal Island, May 20, 1944, 8 specimens; no. 14898, sea level on mud flats at mouth of Tenaru River, Guadalcanal Island, May 20, 1944, 2 specimens.

Previously recorded from Auki, Malaita Island and Bougainville Island, Solomons, by Herre (1931, p. 9).

#### BLENNIIDAE

##### (35) *Salarias guttatus* Cuvier and Valenciennes

No. 14801, Purvis Bay, Florida Island, January 4, 1945, 2 specimens.

Apparently not known from Solomons. Dr. W. M. Chapman made this determination for me.

#### TRIGLIDAE

##### (36) *Abalistes stellaris* (Bloch and Schneider)

No. 14789, Purvis Bay, Florida Island, December 28, 1944, 1 specimen.

Previously unrecorded from the Solomons.

##### (37) *Balistapus capistratus* (Tilesius)

No. 14790, Purvis Bay, Florida Island, December 23, 1944, 1 specimen; no. 14791, same locality, January 15, 1945, 1 specimen; no. 14792, same locality, March 15, 1945, 1 specimen.

Previously unrecorded from the Solomons.

##### (38) *Odonus niger* (Rüppell)

No. 14793, Gavutu Bay, Gavutu Island, Florida Group, May 8, 1945, 1 specimen.

Apparently the first definite locality record for the Solomons.

(39) *Tetraodon nigropunctatus* Bloch  
and Schneider

No. 14794, Tulagi Harbor, Tulagi Island, Florida Group, May 1, 1945, 1 specimen.

Recorded from Shortland Island, Solomons, by Herre (1931, p. 9).

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## Obituaries

FRANÇOIS EMILE MATTHES.—In 1947, after 51 years of distinguished service with the U. S. Geological Survey, François Emile Matthes retired to El Cerrito, Calif. There, near the mountains he loved, he planned to continue the studies to which he had devoted much of his long and fruitful life. These plans, however, were abruptly ended by his death on June 21, 1948, less than a year after his retirement.

Although born in Amsterdam, Holland, on March 16, 1874, he came with his family to America in 1891 and soon became a naturalized citizen. In 1895 he received a B.S. degree from the Massachusetts Institute of Technology and the following year joined the Topographic Branch of the Geological Survey. For almost 20 years he was engaged in the preparation of topographic maps of such spectacular and difficult areas as the Big Horn Mountains, that part of the Rocky Mountains which is now Glacier National Park, the Grand Canyon of the Colorado, Yosemite Valley, and Mount Rainier National Park. The superb artistry and deep understanding of landforms, displayed in his delineation of terrain by the contour line, were matched by his interest in the processes which produced these landforms. His early work in the Big Horn Mountains led directly to studies of glaciation and the geomorphic processes of high altitudes, reported in the first of his long series of publications, *The glacial sculpture of the Big Horn Mountains* (21st Ann. Rep. U. S. Geol. Surv., pt. 2. 1900), in which he named the process of "niva-

tion." In 1914, Mr. Matthes transferred to the Geologic Branch of the Geological Survey in order to devote himself exclusively to studies of glaciers and the development of landforms. However, during both World Wars I and II he was called by the Army and Air Forces to be a consultant. His long record of professional achievements are typified by his classic study, *The geologic history of the Yosemite Valley* (U. S. Geol. Surv. Prof. Pap. 160. 1930).

In 1931 Mr. Matthes was made chairman of the committee on glaciers of the section of hydrology of the American Geophysical Union, charged with collecting the results of studies and measurements of existing glaciers and their fluctuations throughout the world. At the time of his death he was also secretary of the commission on snow and glaciers of the International Association of Scientific Hydrology of the International Union of Geodesy and Geophysics. His interest in glaciers and the processes of glaciation, and his recognition of the recent reestablishment of glaciers in the mountains of western United States, named by him the *Little Ice Age* (chapter on "Glaciers" in *Hydrology, Physics of the Earth Series 9*: 1942), led directly into the disciplines of climatology and meteorology. At the time of his death he was engaged in the completion of an important critical analysis of the glacial anticyclone theory, of which only part 1 has been published, *The glacial anticyclone theory in the light of recent meteorological data from Greenland* (Trans. Amer. Geophys. Union **27**: 324-341. 1946).